

Award Number: W81XWH-10-1-0699

TITLE: Randomized Phase II Trial of Adjuvant WT-1 Analog Peptide Vaccine in Patients with Malignant Pleural Mesothelioma after Completion of Multimodality Therapy

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REPORT DATE: September 2016

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command  
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for public release; distribution unlimited

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| <b>REPORT DOCUMENTATION PAGE</b>   |                         |                                 | <i>Form Approved</i><br><i>OMB No. 0704-0188</i> |  |   |
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| <b>1. REPORT DATE (DD-MM-YYYY)</b><br>Uæ*\æ↑âæãÁĠ€F6   |                         | <b>2. REPORT TYPE</b><br>Annual |  | <b>3. DATES COVERED (From - To)</b><br>15Aug2015 - 14Aug2016 |   |
| <b>4. TITLE AND SUBTITLE</b><br>Randomized Phase II Trial of Adjuvant WT-1 Analog Peptide Vaccine in Patients with Malignant Pleural Mesothelioma after Completion of Multimodality Therapy  |                         |                                 | 5a. CONTRACT NUMBER                              |  |   |
|  |                         |                                 | <b>5a. CONTRACT NUMBER</b>                       |  |   |
|  |                         |                                 | <b>5b. GRANT NUMBER</b><br>W81XWH-10-1-0699      |  |   |
| <b>6. AUTHOR(S)</b><br><br>Dr. Marjorie Zauderer<br><br>email: zauderem@mskcc.org  |                         |                                 | <b>5d. PROJECT NUMBER</b>                        |  |   |
|  |                         |                                 | <b>5e. TASK NUMBER</b>                           |  |   |
|  |                         |                                 | <b>5f. WORK UNIT NUMBER</b>                      |  |   |
| <b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b><br><br>Sloan-KetteringÁØ^b\⇌\ \æÁà~ãÁÓá^´æãÁþææãã´å<br><br>New York, NY 10065  |                         |                                 | <b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>  |  |   |
| <b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b><br><br>U.S. Army Medical Research and Materiel Command<br>Fort Detrick, Maryland 21702-5012   |                         |                                 | <b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>          |  |   |
|  |                         |                                 | <b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>    |  |   |
| <b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b><br><br>Approved for public release; distribution unlimited  |                         |                                 |  |  |   |
| <b>13. SUPPLEMENTARY NOTES</b>   |                         |                                 |  |  |   |
| <b>14. ABSTRACT</b><br>The Wilms' tumor gene, WT1, encodes transcription factors that regulate cell proliferation, differentiation, and apoptosis. WT1 protein is highly expressed in malignant pleural mesothelioma (MPM), and is a rational target for immunotherapy. We have developed a vaccine comprised of four WT1 heteroclitic peptides that are given together with Montanide and GM-CSF as immunologic adjuvants. This WT1 vaccine was previously tested in a small pilot trial, and shown to be safe and immunogenic. We have chosen to test the efficacy of this vaccine in MPM patients who have minimal disease burden after completion of multimodality therapy, but remain at exceedingly high risk for recurrence. The specific aim of this project is to conduct a multicenter, double-blinded, randomized trial comparing treatment with the WT-1 peptide vaccine + Montanide/GM-CSF to treatment with Montanide/GM-CSF alone in patients with MPM who have completed multimodality therapy. The primary endpoint is progression free survival. |                         |                                 |  |  |   |
| <b>15. SUBJECT TERMS</b><br>Nothing listed   |                         |                                 |  |  |   |
| <b>16. SECURITY CLASSIFICATION OF:</b>   |                         |                                 | <b>17. LIMITATION OF ABSTRACT</b><br><br>UU      | <b>18. NUMBER OF PAGES</b><br><br>6                          | <b>19a. NAME OF RESPONSIBLE PERSON</b><br>USAMRMC |
| <b>a. REPORT</b><br>U  | <b>b. ABSTRACT</b><br>U | <b>c. THIS PAGE</b><br>U        |  |  | <b>19b. TELEPHONE NUMBER (include area code)</b>  |

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**INTRODUCTION:**

The Wilms' tumor gene, WT1, encodes transcription factors that regulate cell proliferation, differentiation, and apoptosis. WT1 protein is highly expressed in malignant pleural mesothelioma (MPM), and is a rational target for immunotherapy. We have developed a vaccine comprised of four WT1 heteroclitic peptides that are given together with Montanide and GM-CSF as immunologic adjuvants. This WT1 vaccine was previously tested in a small pilot trial, and shown to be safe and immunogenic. We have chosen to test the efficacy of this vaccine in MPM patients who have minimal disease burden after completion of multimodality therapy, but remain at exceedingly high risk for recurrence. The specific aim of this project is to conduct a multicenter, double-blinded, randomized trial comparing treatment with the WT-1 peptide vaccine + Montanide/GM-CSF to treatment with Montanide/GM-CSF alone in patients with MPM who have completed multimodality therapy. The primary endpoint is progression free survival.

**BODY:**

This project has proceeded as indicated in the approved Statement of Work:

- The peptides were purchased, manufactured, and underwent sterility testing.
  - The peptides were ordered from AmbioPharm, Inc. Once produced, they were vialled under GMP conditions by University of Iowa Pharmaceuticals. The investigational agent completed sterility and stability testing to ensure safety for human use. The vials were delivered to the pharmacy at MSKCC.
- The protocol was reviewed by the various committees at MSKCC and the DOD leading to IRB approval.
  - After IRB approval in September, 2010, the study received approval from the FDA on 12/21/2010. During that time, the protocol was reviewed by the HRPO at the Department of Defense and several comments were made requiring changes to the protocol. The requested changes were made, reviewed by HRPO, and an amendment to the protocol was submitted to the IRB. The amendment was approved on 2/9/11. Final review took place by HRPO and an approval memo was issued on 2/11/11.
  - A start-up meeting was held with the research staff on 2/1/11 to inform all of the participants about the rationale, design, and logistics of this study.
- M.D Anderson Cancer Center received IRB approval for the protocol in August, 2012, but they were unable to enroll their first patient until April, 2013 due to delays related to institutional processes, and FDA and DOD approvals.
- An interim analysis was conducted on May 10, 2015. At that time, on the Montanide + GM-CSF arm had 21 patients and greater than 10 out of the first 20 experienced progression within 1 year. On the Montanide + GM-CSF + WT-1 vaccine arm, there were 19 patients and it was too early to assess the futility endpoint. Based on this, the Montanide + GM-CSF arm met the criteria for closure due to futility while the other arm was recommended to continue enrollment and be reassessed for futility once 20 patients are evaluable for progression at one year. Follow up will continue for patients on both arms.

- Dr. Marjorie G. Zauderer became the PI of this clinical trial and the PI for this grant.
- MSKCC transferred the IND for the WTI vaccine with SELLAS Life Sciences Group.
- An application for a one-year no cost extension was filed and approved.

**KEY RESEARCH ACCOMPLISHMENTS:**

- The planned randomized phase II trial opened at MSKCC and MDACC and has completed enrollment for a total of 41 patients, including 31 at MSKCC and 10 at MDACC. No serious treatment related adverse events have occurred.
- Another interim analysis was performed in October 2015. At that time, the vaccine arm met the pre-specified endpoints for ending enrollment and the study was closed to further accrual.
- An application for a one-year no cost extension was filed and approved.
- Progression and survival follow-up is ongoing.
- Immunologic testing has been completed and data analysis is underway.

**REPORTABLE OUTCOMES:**

This protocol was highlighted in several presentations which have increased exposure and enrollment. This includes:

ASCO 2011, Chicago, IL - poster presented at Trials in Progress Session

World Conference on Lung Cancer, Amsterdam, Jul 2011, slide presentation

Meso Foundation Symposium Jul 2011 and Jul 2012, Washington DC  
<http://www.youtube.com/watch?v=VNUXss6B2uY>

Meso Foundation Podcast February 23, 2012

Meso Foundation conference at University of Pennsylvania 2014

Meso Foundation conference at MSK 2015

Plenary session presentation at the International Mesothelioma Interest Group 2016 Meeting

Poster discussion at the American Society of Clinical Oncology Annual Meeting 2016

**CONCLUSION:**

The clinical trial is now closed to accrual but open for ongoing follow up of patients at both MSKCC and MDACC. A no-cost extension of the grant has been approved in order to finish this follow up. Immunologic testing is complete. Data quality review and statistical analyses are underway in anticipation of a manuscript next year.

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Zauderer MG, Dao T, Rusch V, Ginsberg M, Tsao A, Mehran R, Panageas K, Stergiou A, Scheinberg DA, Krug LM. Randomized phase II study of adjuvant WT1 vaccine for malignant pleural mesothelioma (MPM) after multimodality therapy. American Society of Clinical Oncology 2016 Annual Meeting, Chicago, IL, Poster Discussion Presentation, June 4, 2016.

#### **APPENDICES:**

None

#### **SUPPORTING DATA:**

None